White Paper

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Creating a Suitable and Energy-Efficient Lighting Environment for the Preventive Conservation of the Permanent Collection

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The Indianapolis Museum of Art at Newfields (IMA) has completed a conversion of existing incandescent and fluorescent lamps to LED lamps in all gallery and art storage spaces to safeguard its collection. This project has eliminated ultraviolet emissions from lamps and improved color perception and clarity by allowing lower light levels in the galleries. The conversion also realized a return on investment reflected in reduced electricity utilities costs, a reduced number of lamps purchased per year, and reduced labor costs due to less frequent replacement of the LED lamps. This reduction in operating costs has further enhanced sustainability by making more funds available for exhibition and education programming, as well as collections-based research and activities that deliver exceptional experiences with art to IMA guests, thus helping to drive earned revenue.

General Project Activities

Through allocating capital funds to stockpile existing incandescent lamps for the duration of the project, the IMA was able to maintain current gallery and collection storage lighting as needed prior to and during the LED conversion. New LED lamps were ordered in bulk to maximize purchasing power. The IMA purchased all of the necessary equipment to complete the project, including a Genie lift to provide the Lighting Designer and Lighting Technicians access to light fixtures and tracks in high-ceilinged galleries.

The Museum hired two temporary Lighting Technicians for the grant period to complete re-lamping, and they were trained to a) measure existing light levels of each lamp before replacement, b) light various types of artwork using scrims, dimming, and other strategies as necessary, c) provide fill lighting for visitor comfort, safety, and label legibility, and d) re-measure lamp output to confirm appropriate light levels for each work of art as specified by the Conservation Department.

Lessons Learned

The original live gallery test conducted by the IMA used only LED lamps without any filters. It was discovered that the scalloping effect this caused was not aesthetically ideal. To reduce this, filters were added, which created the potential for heat build-up known to reduce the life of an LED lamp. To mitigate this potential risk, the Lighting Technicians drilled heat reduction holes in the back of each fixture.

As an encyclopedia museum, the IMA found that different types of collections required much different amounts of labor and lamps to properly re-lamp. More densely installed collections, such as Contemporary Design, took much longer than Contemporary Art collections, which tended to have a smaller ratio of objects per square foot. In addition, re-lamping collection storage required the participation of Collections Support staff to relocate artwork and IMA Electricians to rewire light fixtures. During the retrofitting of the object cases, it was discovered that the Museum required new light tracks, fixtures, and wiring in the Asian gallery cases, new

fixtures in the Decorative Arts gallery, and new fiber illuminators in the Native American cases. Case lighting proved to be particularly challenging. While LED PAR lamps in a gallery setting are relatively easy to use and achieve the desired effect, MR16s (or spotlight technology in LED) have not been fully developed. In the case of the IMA's Native American galleries, which are lit by fiber optic lighting, powered remotely by illuminator boxes above the cases, and use an MR16 light source, the Museum had to investigate the company BAND NY, Inc. that makes an illuminator box with an integral LED unit. The IMA tested a demo unit to insure the light output, quality, and proper fit of fiber optic cable harnesses and light bars. The savings in the reduced number of lamps was then applied to additional electrical supplies for the object case lighting.

The IMA also encountered unexpected challenges when lighting textiles or cases that were upholstered with fabric. The LED spectral curves acted in unanticipated ways, and in some instances, they altered the visual appearance of various colors and sometimes made the artwork or upholstery appear flatter than when illuminated with incandescent lamps. The project staff worked around this issue by slightly adjusting the color temperature in these areas.

Key Findings

One of the significant findings is that the IMA now uses 20 percent fewer lamps after converting to LED. This allows the Museum not only to reduce the number of lamps used in each gallery, but it also resulted in more energy savings than originally anticipated. This only differed in a few specific galleries where densely installed three-dimensional objects, the IMA's Contemporary Design galleries for example, required more LEDs than incandescent lamps to achieve the same effect. The actual energy savings twelve months into the project are already over $70,000 when comparing utility bills from the previous year to the current year. Also, as galleries are renovated, the Museum will shift to a system of new lighting tracks with integrated LED fixtures, rather than retrofitting the existing fixtures.

The reduced labor in replacing lamps will continue to have a positive impact on the institution for the next five years. This longevity of the lamps will also allow for reduced operating budgets for re-lamping on an annual basis. However, the IMA is aware that in three-to-five years it will see the lamps start to deteriorate and color shift. Thus, a major capital investment will need to be made at that time to keep the superior color rendering accurate.

Finally, what remains unknown at this time is how the LEDs will impact the natural gas usage in the Museum. LED lamps are significantly cooler in temperature, and as a result do not generate as much heat. This may require more gas usage in the cooler months, but the Museum's cooling costs will be favorably impacted in the warmer months. The IMA just completed its first winter with the LEDs in place and will compare utilities costs in the coming months.